

BIRCH, STEWART, KOLASCH & BIRCH, LLP

TERRELL C. BIRCH
RAYMOND C. STEWART
JOSEPH A. KOLASCH
JAMES M. SLATTERY
BERNARD L. SWEENEY*
MICHAEL K. MUTTER
CHARLES GORENSTEIN
GERALD M. MURPHY, JR
LEONARD R. SVENSSON
TERRY L. CLARK
ANDREW D. MEIKLE
MARC S. WEINER
JOE McKINNEY MUNCY
ROBERT J. KENNEY
DONALD J. DALEY
JOHN W. BAILEY
JOHN A. CASTELLANO
GARY D. YACURA

OF COUNSEL:
HERBERT M. BIRCH (1905-1996)
ELLIOT A. GOLDBERG*
WILLIAM L. GATES*
EDWARD H. VALANCE
RUPERT J. BRADY (RET)*
F. PRINCE BUTLER
FRED S. WHISENHUNT

*ADMITTED TO A BAR OTHER THAN VA

INTELLECTUAL PROPERTY LAW

8110 GATEHOUSE ROAD
SUITE 500 EAST
FALLS CHURCH, VA 22042-1210
USA

(703) 205-8000

FAX (703) 205-8050
(703) 698-8590 (G IV)

e-mail: mailroom@bskb.com
web: http://www.bskb.com

CALIFORNIA OFFICE
COSTA MESA, CALIFORNIA

THOMAS S. AUCHTERLOE
JAMES T. ELLER, JR
SCOTT L. LOWE
MARK J. NUEL, PH.D.
D. RICHARD ANDERSON
PAUL C. LEWIS
MARK W. MILSTEAD*
RICHARD J. GALLAGHER
JAYNE M. SAYDAH*
MARYANNE ARMSTRONG
HYUNG N. SOHN
ALAN PEDERSEN-GILES
KECIA J. REYNOLDS

REG. PATENT AGENTS
FREDERICK R. HANDREN
MAKI HATSUMI
MIKE S. RYU
CRAIG A. McROBBIE
GARTH M. DAHLEN, PH.D.
ROBERT E. GOOZNER, PH.D.
MATTHEW J. LATTIG
TIMOTHY R. WYCKOFF
KRISTI L. RUPERT, PH.D.
LARRY J. HUME
ALBERT K. LEE
HARAY A. SAYADIAN, PH.D.
EVE L. FRANK, PH.D.
MATTHEW T. SHANLEY



Date: November 6, 2000
Docket No.: 3449-0137P

Assistant Commissioner for Patents
Box PATENT APPLICATION
Washington, D.C. 20231

Sir:

Transmitted herewith for filing is the patent application of

Inventor(s): HWANG, Min-Kyu
LEE, Jae-Chun; LEE, Sang-Kyun

For: ONE SYSTEM MODULE FOR ELECTRIC/ELECTRONIC APPLIANCE

Enclosed are:

- ☒ A specification consisting of 12 pages
- ☒ 3 sheet(s) of formal drawings
- ☒ An assignment of the invention
- ☒ Certified copy of Priority Document(s)
- ☒ Executed Declaration ☒ Original ☐ Photocopy
- ☐ A verified statement to establish small entity status under 37 CFR 1.9 and 37 CFR 1.27
- ☐ Preliminary Amendment
- ☐ Information Disclosure Statement, PTO-1449 and reference(s)

Other _____

The filing fee has been calculated as shown below:

LARGE ENTITY				SMALL ENTITY			
FOR	NO. FILED	NO. EXTRA	RATE	FEE		RATE	FEE
BASIC FEE	***** ***** *****	***** ***** *****	***** ***** *****	\$710.00	or	**** **** ****	\$355.00
TOTAL CLAIMS	3 - 20 =	0	x18 = \$	0.00	or	x 9 = \$	0.00
INDEPENDENT	1 - 3 =	0	x80 = \$	0.00	or	x 40 = \$	0.00
MULTIPLE DEPENDENT CLAIM PRESENTED <u>no</u>				+270 = \$	or	+135 = \$	0.00
TOTAL \$				710.00		TOTAL \$	0.00

X A check in the amount of \$ 750.00 to cover the filing fee and recording fee (if applicable) is enclosed.

____ Please charge Deposit Account No. 02-2448 in the amount of \$ _____. A triplicate copy of this transmittal form is enclosed.

____ No fee is enclosed.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. 1.16 or under 37 C.F.R. 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART KOLASCH & BIRCH, LLP

By 

TERRY L. CLARK
Reg. No. 32,644
P. O. Box 747
Falls Church, Virginia 22040-0747

(703) 205-8000
TLC/djm

ONE SYSTEM MODULE FOR ELECTRIC/ELECTRONIC APPLIANCE

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to one system module which integrates an inverter and a peripheral circuit with each other which are adopted in an electric/electronic appliance, and more particularly, the present invention relates to one system module for an electric/electronic appliance, in which pins are located adjacent to three edges on a surface of a case, whereby applicability of the one system module to the electric/electronic appliance is improved and a size of the one system module is reduced.

Description of the Related Art

FIG. 1 is a perspective view illustrating an outer appearance of the conventional one system module.

As shown in FIG. 1, the conventional one system module 100 includes a case 101 having a rectangular parallelepiped-shaped configuration, and power pins 102 and signal pins 103 which are arranged adjacent to both long edges on an upper surface of the case 101. Here, the power pins 102 comprises three phase U, V and W pins for being connected with a motor (not shown) and pins for supplying DC power (for example, DC

310V) which is obtained by rectifying AC power (for example, AC 220V). The signal pins 103 are used for interfacing a microcomputer (micom) and other sensors. In FIG. 1, the drawing reference numeral 101t represents an engaging protrusion where a heat sink (not shown) is attached to the case 101.

FIG. 2 is a block diagram schematically illustrating a structure of a power board which is arranged in the one system module of FIG. 1.

Referring to FIG. 2, the power board 200 comprises a ceramic substrate 201, and a variety of circuit devices and parts which are located on the ceramic substrate 201. In other words, on the ceramic substrate 201, there are located a power device section 202 which are formed by connection between a plurality of (for example, respectively six) insulated gate bipolar transistors (IGBTs) and free wheeling diodes (FWDs), a gate drive (HVIC) 203 for driving the IGBTs, an over-current sensing section 204 for sensing over-current which flows through the IGBTs, an over-temperature sensing section 205 for sensing over-temperature of the IGBTs, a rectifying section 206 for rectifying AC power inputted from the outside to DC power, an power supplier (SMPS) (207) for supplying power to devices in the one system module, and so forth. The power board 200 which is structured as mentioned above, is disposed adjacent to a lower end inside the module.

FIG. 3 is a block diagram schematically illustrating a structure of a signal board which is arranged in the one system module of FIG. 1.

Referring to FIG. 3, the signal board 300 comprises an epoxy substrate 301, and a diversity of circuit devices and parts which are located on the epoxy substrate 301. That is to say, on the epoxy substrate 301, there are located a microcomputer 302 for driving the IGBTs which are installed on the power board 200, a bootstrap circuit 303, a load driving section 304 for driving an optional load (for example, a motor), a microcomputer peripheral circuit 305, and so on. The signal board 300 which is structured as mentioned above, is disposed over and electrically connected to the power board 200.

FIG. 4 is a cross-sectional view taken along the line A-A' of FIG. 1.

As can be readily seen from FIG. 4, the power board 200 is disposed adjacent to a lower end of the case 101 and the signal board 300 is disposed over the power board 200. And, as described above, the power board 200 and the signal board 300 are electrically connected with each other by connection cords 401.

On the other hand, the conventional one system module constructed as mentioned above has a double-layered structure in which the signal board 300 is superposed on the power board

200 inside the case 101. In this double-layered structure, since the power pins 102 and the signal pins 103 are simultaneously arranged adjacent to the same edge on the upper surface of the case 101, a problem is caused in that
5 assemblability is deteriorated when the one system module is applied to an appliance. Further, because all the power pins 102 are arranged adjacent to only one edge on the upper surface of the case 101, an entire size of the one system module is increased.

SUMMARY OF THE INVENTION

Accordingly, the present invention has been made in an effort to solve the problems occurring in the related art, and
15 an object of the present invention is to provide one system module for an electric/electronic appliance, in which pins are located adjacent to three edges on a surface of a case, whereby applicability of the one system module to the electric/electronic appliance is improved and a size of the
20 one system module is reduced.

In order to achieve the above object, according to one aspect of the present invention, there is provided one system module for an electric/electronic appliance, comprising: a case constituting a body of the one system module; power pins
25 and signal pins disposed adjacent to three edges on a surface

of the case in a manner such that substantially a U-shaped arrangement is obtained; a power board located inside the case and electrically connected with the power pins; and a signal board located inside the case and electrically connected with the signal pins.

According to another aspect of the present invention, at least two corner portions among four corner portions of the case, which two corner portions are opposite to each other in a diagonal direction, are defined with engaging holes, respectively, through which the case and a heat sink are coupled with each other.

According to still another aspect of the present invention, connecting pins and inserting holes through which the connecting pins are inserted, respectively, are complementarily formed and defined on and in the power board and the signal board, so as to electrically connect the power board and the signal board with each other.

By the features of the present invention, since power pins and signal pins are disposed adjacent to three edges on a surface of a case, other than in the conventional art, an entire size of the one system module can be reduced, and when the one system module is applied to an appliance, assemblability of the appliance is improved.

BRIEF DESCRIPTION OF THE DRAWINGS

The above objects, and other features and advantages of the present invention will become more apparent after a reading of the following detailed description when taken in conjunction with the drawings, in which:

FIG. 1 is a perspective view illustrating an outer appearance of the conventional one system module;

FIG. 2 is a block diagram schematically illustrating a structure of a power board which is arranged in the one system module of FIG. 1;

FIG. 3 is a block diagram schematically illustrating a structure of a signal board which is arranged in the one system module of FIG. 1;

FIG. 4 is a cross-sectional view taken along the line A-A' of FIG. 1;

FIG. 5 is a perspective view illustrating an outer appearance of one system module for an electric/electronic appliance in accordance with an embodiment of the present invention; and

FIG. 6 is a cross-sectional view taken along the line B-B' of FIG. 5.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference will now be made in greater detail to a

preferred embodiment of the invention, an example of which is illustrated in the accompanying drawings. Wherever possible, the same reference numerals will be used throughout the drawings and the description to refer to the same or like parts.

Referring to FIGs. 5 and 6, one system module 500 for an electric/electronic appliance in accordance with an embodiment of the present invention includes a case 501 which constitutes a body of the one system module 500, power pins 502 and signal pins 503 which are disposed adjacent to three edges on a surface of the case 501 in a manner such that substantially a U-shaped arrangement is obtained, a power board 504 which is located inside the case 501 and electrically connected with the power pins 502, and a signal board 505 which is located inside the case 501 and electrically connected with the signal pins 503. Here, in the preferred embodiment of the present invention, at least two corner portions among four corner portions of the case 501, which two corner portions are opposite to each other in a diagonal direction, are defined with engaging holes 501h, respectively, through which the case 501 and a heat sink (not shown) are coupled with each other. Moreover, a plurality of connecting pins 504p are formed on the power board 504 so as to electrically connect the power board 504 and the signal board 505 with each other, and a plurality of inserting holes through which the connecting pins

504p are inserted, respectively, are defined in the signal board 505. In this regard, a person skill in the art will readily recognize that the connecting pins 504p and the inserting holes can be formed and defined vice versa. Namely, the connecting pins 504p can be formed on the signal board 505, and the inserting holes can be defined in the power board 504.

Among the plurality of power pins 502, five pins which are arranged adjacent to one long edge on the surface of the case 501, comprise three phase U, V and W pins (inward placed three pins) which are connected to a motor, and a plus pin and a minus pin (outward placed two pins) for receiving DC link voltage (for example, 310V). Also, among the plurality of power pins 502, four pins which are arranged adjacent to a short edge on the surface of the case 502, are used for power supply.

As described above, by the one system module for an electric/electronic appliance according to the present invention, since power pins and signal pins are disposed adjacent to three edges on a surface of a case to obtain substantially a U-shaped configuration, other than in the conventional art, an entire size of the one system module can be reduced, and when the one system module is applied to an appliance, assemblability of the appliance is improved.

In the drawings and specification, there have been

disclosed typical preferred embodiments of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being set forth in the following claims.

5

COPIES OF THIS DOCUMENT ARE AVAILABLE FROM THE NATIONAL ARCHIVES AT COLLEGE PARK, MARYLAND

WHAT IS CLAIMED IS:

1. One system module for an electric/electronic appliance, comprising:

5 a case constituting a body of the one system module;
power pins and signal pins disposed adjacent to three edges on a surface of the case in a manner such that substantially a U-shaped arrangement is obtained;

10 a power board located inside the case and electrically connected with the power pins; and

a signal board located inside the case and electrically connected with the signal pins.

15 2. The one system module as claimed in claim 1, wherein at least two corner portions among four corner portions of the case, which two corner portions are opposite to each other in a diagonal direction, are defined with engaging holes, respectively, through which the case and a heat sink are coupled with each other.

20 3. The one system module as claimed in claim 1, wherein connecting pins and inserting holes through which the connecting pins are inserted, respectively, are complementarily formed and defined on and in the power board
25 and the signal board, so as to electrically connect the power

board and the signal board with each other.

ABSTRACT OF THE DISCLOSURE

Disclosed is one system module for an electric/electronic appliance. The one system module comprises a case constituting a body of the one system module; power pins and signal pins disposed adjacent to three edges on a surface of the case in a manner such that substantially a U-shaped arrangement is obtained; a power board located inside the case and electrically connected with the power pins; and a signal board located inside the case and electrically connected with the signal pins. At least two corner portions among four corner portions of the case, which two corner portions are opposite to each other in a diagonal direction, are defined with engaging holes, respectively, through which the case and a heat sink are coupled with each other. Connecting pins and inserting holes through which the connecting pins are inserted, respectively, are complementarily formed and defined on and in the power board and the signal board, so as to electrically connect the power board and the signal board with each other.

Fig. 1

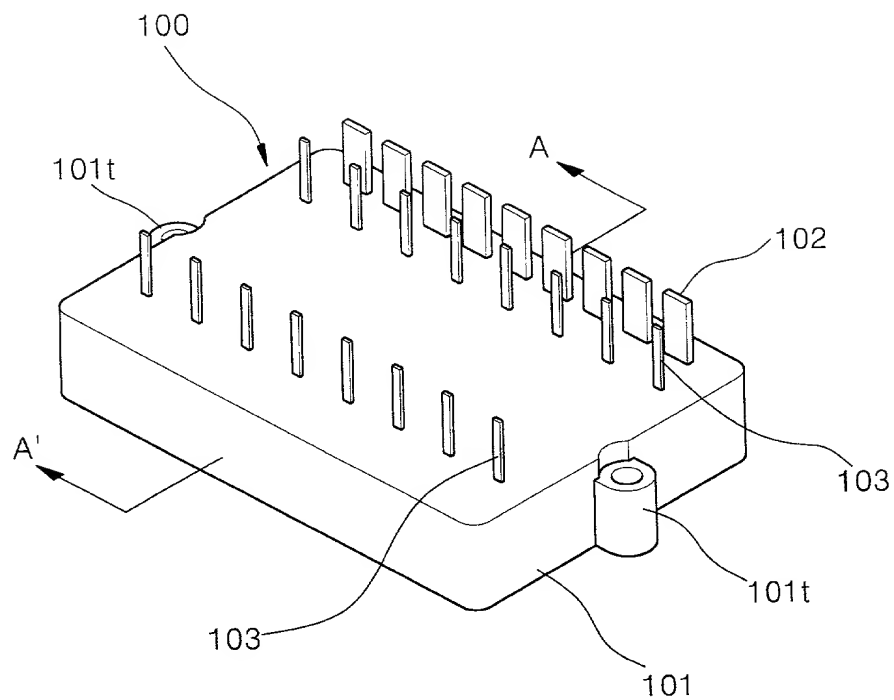


Fig. 2

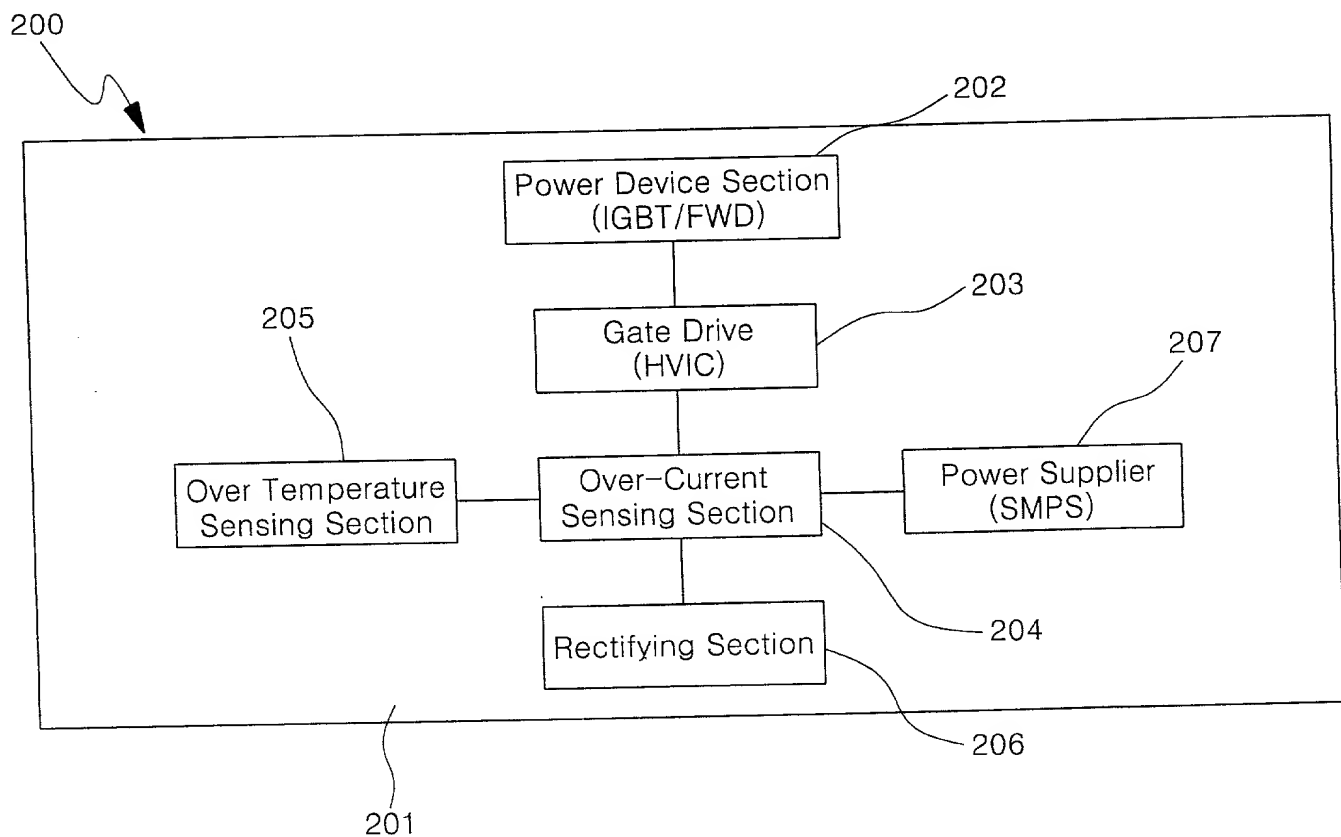


Fig. 3

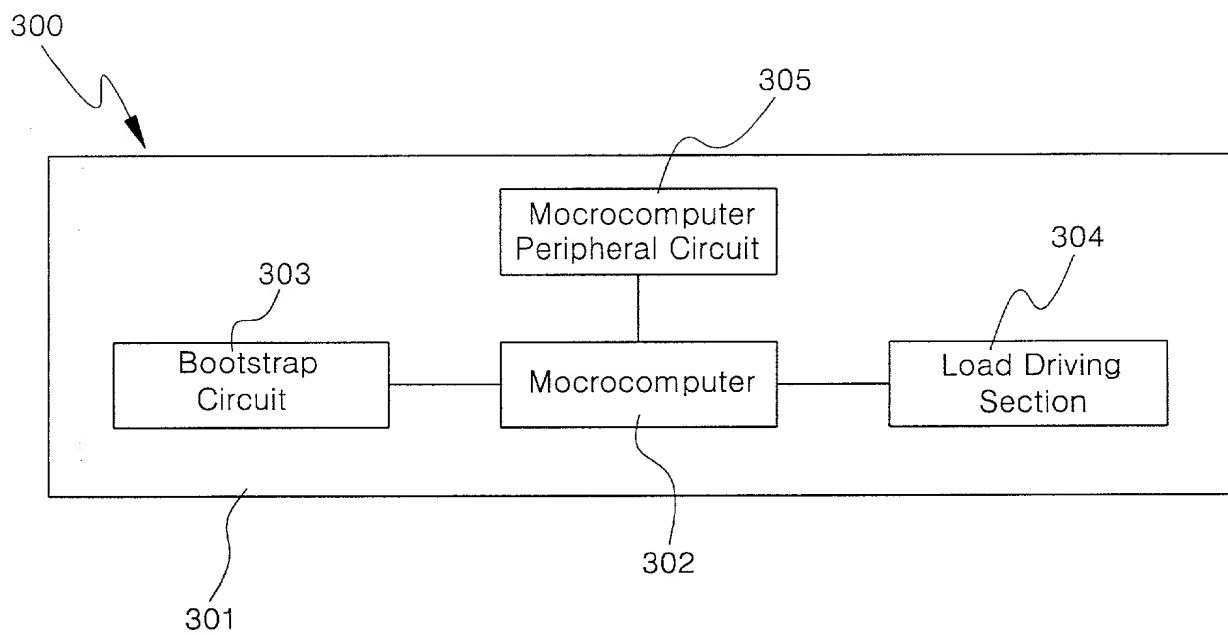


Fig. 4

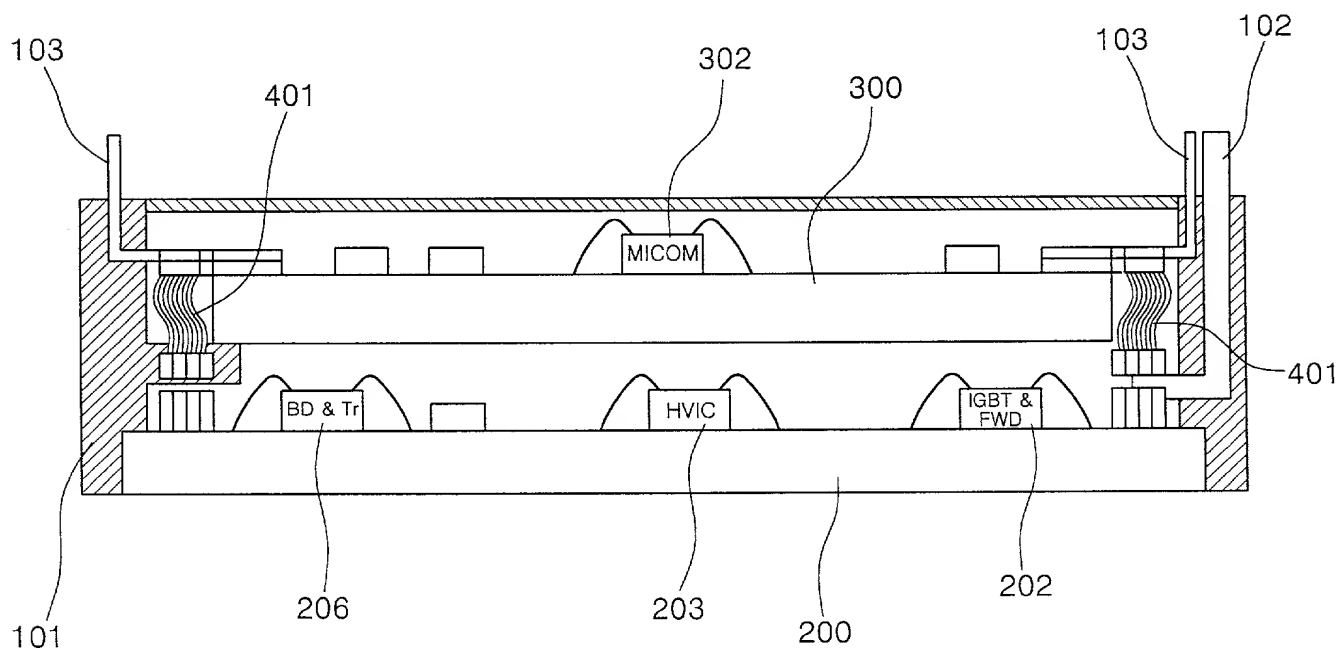


Fig. 5

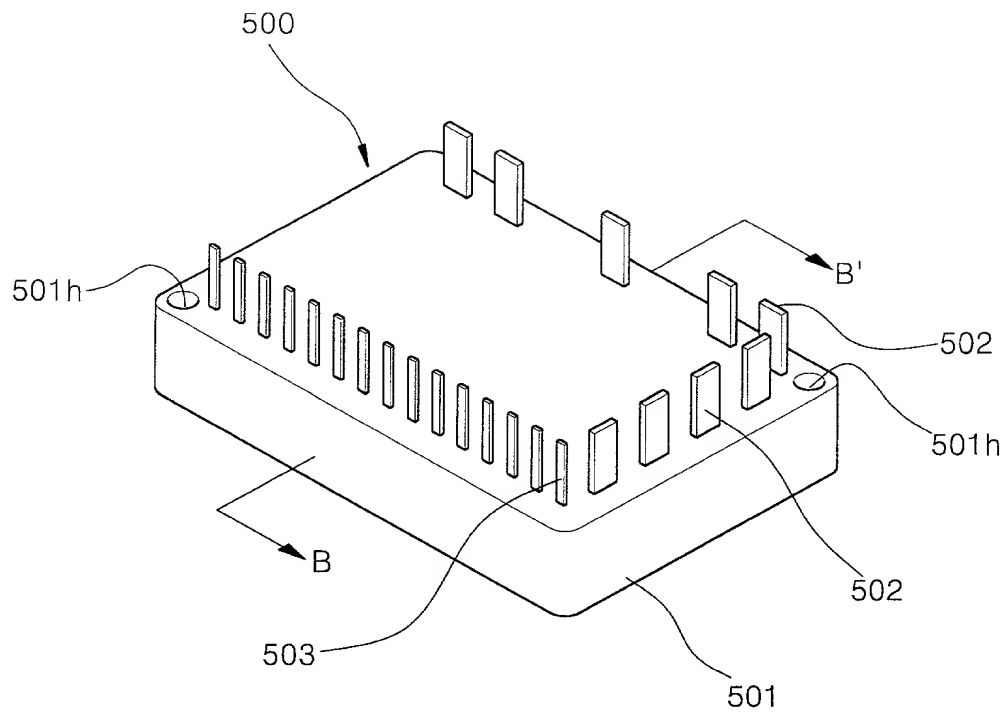
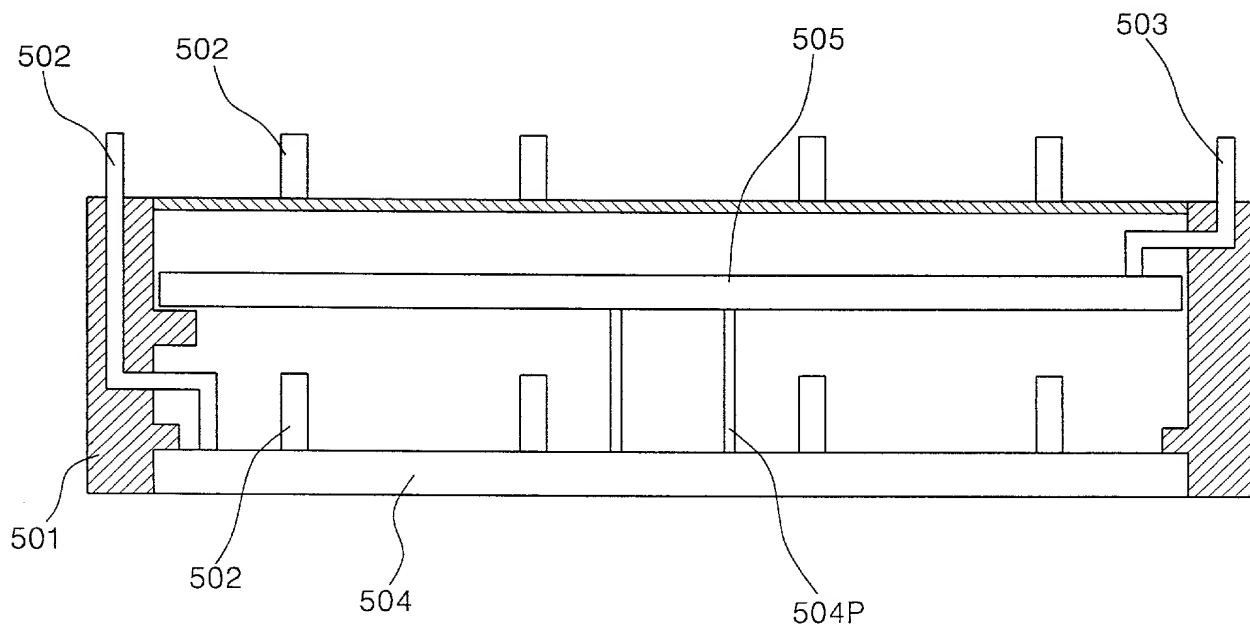


Fig. 6



BIRCH, STEWART, KOLASCH & BIRCH, LLP

P.O. Box 747 • Falls Church, Virginia 22040-0747
Telephone: (703) 205-8000 • Facsimile: (703) 205-8050

PLEASE NOTE:
YOU MUST
COMPLETE THE
FOLLOWING

COMBINED DECLARATION AND POWER OF ATTORNEY
FOR PATENT AND DESIGN APPLICATIONS

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated next to my name; that I verily believe that I am the original, first and sole inventor (if only one inventor is named below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

ONE SYSTEM MODULE FOR ELECTRIC/ELECTRONIC APPLIANCE

Insert Title:

Fill in Appropriate
Information -
For Use Without
Specification
Attached:

the specification of which is attached hereto. If not attached hereto,

the specification was filed on _____ as
United States Application Number _____;
and amended on _____ (if applicable) and/or
the specification was filed on _____ as PCT
International Application Number _____; and was
amended under PCT Article 19 on _____ (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I do not know and do not believe the same was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representative or assigns more than twelve months (six months for designs) prior to this application, and that no application for patent or inventor's certificate on this invention has been filed in any country foreign to the United States of America prior to this application by me or my legal representatives or assigns, except as follows.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

66133/1999 Republic of Korea
(Number) (Country)

December 30, 1999
(Month/Day/Year Filed)

Priority Claimed

☒ Yes ☐ No

(Number) (Country)

(Month/Day/Year Filed)

☐ Yes ☐ No

(Number) (Country)

(Month/Day/Year Filed)

☐ Yes ☐ No

(Number) (Country)

(Month/Day/Year Filed)

☐ Yes ☐ No

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional applications(s) listed below.

Insert Provisional
Application(s):
(if any)

(Application Number)

(Filing Date)

(Application Number)

(Filing Date)

All Foreign Applications, if any, for any Patent or Inventor's Certificate Filed More than 12 Months (6 Months for Designs) Prior to the Filing Date of This Application:

Country

Application Number

Date of Filing (Month/Day/Year)

Insert Requested
Information:
(if appropriate)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States and/or PCT application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States and/or PCT application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to the patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

Insert Prior U.S.
Application(s):
(if any)

(Application Number)

(Filing Date)

(Status - patented, pending, abandoned)

(Application Number)

(Filing Date)

(Status - patented, pending, abandoned)

I hereby appoint the following attorneys to prosecute this application and/or an international application based on this application and to transact all business in the Patent and Trademark Office connected therewith and in connection with the resulting patent based on instructions received from the entity who first sent the application papers to the attorneys identified below, unless the inventor(s) or assignee provides said attorneys with a written notice to the contrary:

Raymond C. Stewart
Joseph A. Kolasch
Bernard L. Sweeney
Charles Gorenstein
Leonard R. Svensson
Andrew D. Meikle
Joe McKinney Muncy
John W. Bailey
Gary D. Yacura

(Reg. No. 21,066)
(Reg. No. 22,463)
(Reg. No. 24,448)
(Reg. No. 29,271)
(Reg. No. 30,330)
(Reg. No. 32,868)
(Reg. No. 32,334)
(Reg. No. 32,881)
(Reg. No. 35,416)

Terrell C. Birch
James M. Slattery
Michael K. Mutter
Gerald M. Murphy, Jr.
Terry L. Clark
Marc S. Weiner
Donald J. Daley
John A. Castellano

(Reg. No. 19,382)
(Reg. No. 28,380)
(Reg. No. 29,680)
(Reg. No. 28,977)
(Reg. No. 32,644)
(Reg. No. 32,181)
(Reg. No. 34,313)
(Reg. No. 35,094)

Send Correspondence to:

BIRCH, STEWART, KOLASCH & BIRCH, LLP

or **Customer No. 2292**

P.O. Box 747 • Falls Church, Virginia 22040-0747

Telephone: (703) 205-8000 • Facsimile: (703) 205-8050

PLEASE NOTE:
YOU MUST
COMPLETE
THE
FOLLOWING:

Full Name of First
or Sole Inventor:
Insert Name of
Inventor
Insert Date This
Document is Signed

Insert Residence
Insert Citizenship

Insert Post Office
Address

Full Name of Second
Inventor, if any:
see above

Full Name of Third
Inventor, if any:
see above

Full Name of Fourth
Inventor, if any:
see above

Full Name of Fifth
Inventor, if any:
see above

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

GIVEN NAME/FAMILY NAME Min-Kyu HWANG		INVENTOR'S SIGNATURE <i>Min Kyu</i>	DATE* 2000.10.13
Residence (City, State & Country) Kyounggi-do, Korea		CITIZENSHIP Republic of Korea	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) Gocheongjugong-apartment 1217-1102, Haan-dong, Kwangmyoung-si, Kyounggi-do, Korea			
GIVEN NAME/FAMILY NAME Jae-Chun LEE		INVENTOR'S SIGNATURE <i>Lee Jaechoon</i>	DATE* 2000.10.13
Residence (City, State & Country) Seoul, Korea		CITIZENSHIP Republic of Korea	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) Woosung-Parkvilla B02, 161, Kaepo2-dong, Kangnam-gu, Seoul, Korea			
GIVEN NAME/FAMILY NAME Sang-Kyun LEE		INVENTOR'S SIGNATURE <i>Lee Sangkyun</i>	DATE* 2000.10.13
Residence (City, State & Country) Kyounggi-do, Korea		CITIZENSHIP Republic of Korea	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country) Gocheongjugong-apartment 302-1411, Haan-dong, Kwangmyoung-si, Kyounggi-do, Korea			
GIVEN NAME/FAMILY NAME		INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)			
GIVEN NAME/FAMILY NAME		INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)			